Hence we have both the reaction with the water in the wood and the pulling of the chemical into the wood. Solvents which allow this function are given in the preferred embodiment.

On page 6 line 10 it is disclosed: "By using the natural liquids of the wood to literally "pull the chemical into the wood while simultaneously reacting with these liquids..."

The generation of pressure and heat by the reaction are important because it differentiates the prior art patents.

For example, on page 3 line 17 through 22, there is a discussion of how it is necessary to use carriers to force chemicals inside of the wood in the prior art. It is also discussed on page 11 line 22 through page 12 line 9.

Contrasting the invention on page 13 line 5 "WPTC does not require high pressure, to force a chemical into wood."

Page 17, lines 4 through 12, describes the use of the catalytic acid reaction to draw the reactants into the wood.

The issue of the exothermic reaction is clearly shown in the specification, for example on page 23 line 4 through 9. That portion says that the heat generated by the reaction and pressure generated by the reaction are both indicated, the heat being mentioned twice.

Given the fact that exothermic can have different meanings (for example, any release on energy can be exothermic including, heat, light or sound), the claims are modified to more closely track the specification.

This rejection is dealt with by taking out the word exothermic and putting in to the words heat generating. While exothermic should not be a problem given disclosure in the specification, the applicant clarified the claims. The examiner makes a great deal of the fact that a heated

reaction is consistent the chemicals but no prior art shows a reaction which pulls the chemicals from the solvent into the wood. The heat generating feature is important only as a symptom of the more important feature of the reaction pulling the reactants into the wood versus a different mechanism.

ITEM 7.

The same logic deals with the problem that the examiner has with the phrase "self initiating". The language from the specification on page 6 lines 9 through 14 is used in the amended claim 75 which describes "..water in the wood pulling the solutes into the wood while simultaneously reacting..."

This is clearly disclosed in the specification and the language is better than self initiating. Rather than requiring heat and pressure, the process involves utilizing the water in the wood and acid in the solvent in order to carry out the reaction. Claim 81 has been amended in order to clearly disclose the absence of outside heat which is clearly disclosed and described above.

The solvents and their use with the other reactants may therefore be identified in terms of function which strengthens the patent. The solvents which serve the function are given by way of example.

A fax was sent to the examiner in July of 2003 which included the affidavits which are being submitted herewith. Copies are attached hereto because the patent has not been previously examined in light of those affidavits. Those affidavits show the results are superior results to the prior art. The petitioner feels that the changes between the claims and the prior art are non obvious and the affidavits clearly point that out. While the examiner has questioned whether these fully investigate the prior art, as best understood by the inventor the prior art offers nothing

more and the examiner has made no specific reference to the prior art which rebuts the novelty taught in the instant claims as evidenced in the affidavits.

Item 14. Procatalyst is replaced with language from the specification.

Item 15. No comment required.

Item 16 (a) Addressed above. Treatment is removed.

(b) corrected.

(c) corrected to show reaction with cellulose in the wood.

(d) % is based on weight. Percent: expression of concentration of a solution: Found by dividing the mass of solute in grams by the mass of the entire solution (mass of solute + mass of solvent, in grams). See for example Belton, J. glossary: http://challenge.utep.edu/users/jbelton (Online) (2003).

Strong acids are well defined in the art. See for example: "Ambuslyst JM Polymeric Catalysts Ion Exchange" http://www.rohmhaas .com/ionexchange/IP/sac.htm (online) (2003).

Strong acid: an acid that gives a 100% yield of hydronium ions when dissolved in water "glossary". http://www.chem.purdue.edu/gchelp/gloss.htm (2003) (online).

(e) removed.

(f) corrected

(g)corrected

(h)corrected

(i)corrected (see above in claims)

(j)corrected

(k)corrected (see above in claims)

OBJECTIONS IN THE SPECIFICATION

These have been previously set forth above as best understood. Additional consideration includes the following:

1. The examiner has objected to the two mentions of sodium silicate and borax which appear on pages 12 line 18 and page 13 line 13.

2. On pages 34 and 35 of the specification, it discusses the modification process by "selecting an additive which may enhance desired property from the group of properties comprising.." and then a list follows.

3. It is noted that the two substances mentioned, namely sodium silicate and borax, are the types of substances mentioned on pages 34 and 35 and one reading the patent specification would see that those chemicals in the specification are adequately disclosed in the disclosure which follows under the broad categories which borax and sodium silicate are known to fall into in the prior art. Even if it did not, their mention has no effect on the remaining disclosure

4. Since the broadest claims do not require the addition of these additives into the process, the purpose of the objection is uncertain and it is felt that its adequately dealt with for purposes for clearing up what is an apparently inconsequential objection.

5. The examiner has also questioned the use of the formula $R\text{-}X_a\text{-}Xb_3\text{-}R$ or $R_3\text{-}X_a\text{-}X_b$ with the comment on page 4 of the office action if those would not be correct for trivalent or pentavalent Xa, but would be correct for tetravalent.

7. In order to correct this, the following is suggested as a modification to the specification. Please replace the paragraph objected to with the following:

"The basic structure of a molecule is used in the process described herein: $R\text{-}X_a\text{-}Xb_3$ or $R_3\text{-}X_a\text{-}Xb$ where R is a carbon compound, X_a is a tetravalent atom (which may be substituted with trivalent or pentavalent atoms in other embodiments), and Xb is a halogen (fluorine, chlorine, bromine, etc.) or their equivalent.

8. The other correction in the specification is the finishing of the sentence on page 28 lines 3-4 by replacing the paragraph with the following:

"SOLVENT: The solvent can vary tremendously also although it is preferably a non water based solvent so as not to cause a reaction or a minimal water solvent."

Status Of Claims

Applicant Response To Rejection Under 35 U.S.C. 112

The language appearing in claims as amended accepts the wisom of tracking the specification more closely and avoids the rejections based on symantics (exothermic,hydrophilic etc.) and concentrates on the fact that the reactants are a combination of catalytic and non-catalytic reagents in a "water compatible" solvent which allows the acid to be hydrolyzed and the solute and acid to be "drawn" from the solvent into the wood without external energy. This language is supported in the specification as set forth herein. Specific solvents are also identified to further distinguish this in claim 120.

As discussed in the Examiner Interview, support for exothermically reacting said one or more molecules with said wood cellulose (*see e.g.* claims 46 & 65) can be found in the specification on page 22, at lines 4-8.

Figures 6, 7, 8, and 10 shows hydrolyzing alignment of the solute compounds with the matrix formed by the wood cellulose during the bonding process and this disclosure is captured in claims.

The prior claims show one or more molecules are cross linked to the wood cellulose. In the new claims this is more particularly claimed as the resulting cyclic and cojoined or interlocking cyclic compounds formed with the wood cellulose as are particularly shown in Figure 6 and 6A and more generally in Figure 7, 8d, 10c, and more particularly again in Figure 11 (b1) and 11 (b2) and Figure 12b and c as well as in Figure 15 and 16 generally.

Although as discussed above, procatalyst and non-procatalyst are terms which are defined in the claims and in the specifications sufficiently as to not add new matter, they are taken out of the claims as shown in order to clarify this for the purpose of satisfying any possible rejection which the examiner might have to the inclusion of terms which are fully defined in the specification. This is done in the amended claims.

Procatalyst and non-procatalysts as used in the claims are taught on page 15 line 18, page 17 line 4-12 (including a limitation of .5-5%), page 19 line 17-22, page 20 line 9-12 (disclosing a limit of .1-10%), original claims 34-36 and 38-43 which are added to the specification by amendment). [Creating an acid which can further catalyze the reaction] and are shown in concentration between .01% and 10% on page 20 line 14.

Figure 7 shows the suspected chemical process disclosed by the specification. In Figure 7, methyl trichloro silane is used as a reactant or catalyst (as discussed in more detail below in reference to Figures 13 and 14). There are n molecules of the catalyst which react with n molecules of H20 present in the wood to yield n times 3 HCl molecules providing an acid environment for catalyzing the reaction of the silicate with the hydroxyl group. This reaction draws the reactants into the wood and allows for a greater penetration of the wood of the treatment. Aside from generating the acid environment, the silicate is converted to a hydroxyl

form 30 (postulated) which forms a chain as shown at 32 which in proximity to the hydroxyl groups coming off of the cellulose ring units 34 reacts to form the silicate structure.

"Boron may be added as boric acid to the formula effectively in the range of .5 to 5% and is trapped in the silicone matrix. Alternatively, a reactive boron reagent of the type discussed above may be used to form a boron matrix such as that disclosed in Figure 10 when used in conjunction with a reactive silicate."

"The acid catalyst could even be in the range of 0.01 to 10%. The 10% figure is pushing the reaction as a 10% additive would not be a catalyst but would be an environmental change. A base catalyst may also be employed, but is less effective within the same range. Examples are metal alkoxides [eg.sodium methoxide] Ammonia, Organic bases [eg. Triethylamine]."

Acid reducing compounds are taught on page 34 lines 10- 11.

"At any point the reagents may be drained through a valve in a drain 5 and other chemicals, such as acid neutralizing agent may be added to wash or treat the wood."

And on page 27 lines 12-15:

"If, in a reaction, hydrochloric acid is released it would preferably be diluted, degraded (neutralized), or otherwise removed during or after the treatment process to prevent the degradation of the wood or irritation caused by the slow release of this acid to the environment. It could, for example, be converted to environmentally safe and natural salts."

The claims (100 and 101) have been amended to replace acid reducing compound with an acid neutralizing agent in order to be consistent with the specific words used in the specification.

Solvation by water is shown on page 5 line 13-15, page 6 line 10-11, page 9 line 17, page 15 line 13-15, page 17 line 6-10, page 23 line 2, page 26 line 10-13 and page 22 line 2-3

specifically referring to the reactants being "hydrolized by water in the wood." In the '165 patent this is also shown on page 10 line 2-3.

"Because WPTC is drawn into the wood through a molecular reaction, it actually works faster on a green piece of wood. This is due to the fact that the chemical reaction of WPTC is accelerated by the reaction or mixture with water."

"Natural liquids of the wood to literally pull the chemical into the wood

The chemical itself reacts very strongly with liquids.

Creating an acid during a reaction with the cellulose or water within the wood"

"n molecules of the catalyst which react with n molecules of H20 present in the wood to yield n times 3 HCl molecules providing an acid environment for catalyzing the reaction of the silicate with the hydroxyl group. This reaction draws the reactants into the wood and allows for a greater penetration of the wood of the treatment."

"The reaction is enhanced by water within the wood."

"Trimethylborate [TMB]. This reagent reacts with water/mixture within wood to undergo partial or full hydrolysis to polyborates or boric acid respectively. (See Figures 8, 9 and 10). It could react after partial hydrolysis with methyltrihydroxysilane to form mixed boron and silicon polymers as shown."

"As shown in Figure 10, the MCl_3Si and boron has hydrolized to produce $MSi(OH)_3$ and $B(OH)_3$."

"Though the molecular change that occurs in the treatment process changes some of the molecular components of the wood, it does not change the structural character of the wood."

The cyclic structure referred to is clearly shown on page 16 line 10-22, page 17 lines 1-3

and in Figures 6a-6c. It is also shown in claims (original) 34-36 and 38-43 which have been added to the specification by amendment.

"Figure 6A shows a less likely structure for the molecular bonding where the cellulose in the preferred embodiment may contain, by exposure within the disclosure to silicone and boron reactant molecules and solutions, a limited replacement of the hydroxyl groups with boron and silicone becoming a part of the silicone chain. It is therefore one product which is claimed by the invention which is a cellulose chain modified to have bonded between hydroxyl oxygen atoms 23 boron atoms 24, silicone atoms 25 or other hydrophobic or anti-degrading elements. As can be seen by reference to Figure 6A, these silicone atoms are preferably silicone atoms which have alkyl groups 26 attached to form alkyl silicates. It is taught that these alkyl groups may be varied according to the disclosure set forth below or may be replaced altogether."

"As can best be seen by reference to Figure 6B, the expected end product involves the binding across the hydroxyl groups of the cellulose rings 37 of atoms or molecules (here boron or alkyl silicates) with the outer valence shells being competed across Oxygen molecules 40 between the atoms or molecules. Figure 6B also shows how it is possible that the binding would be less organized than that suggested in Figure 6a and that there may be binding across more than one hydroxyl group in a single cellulose molecule within a chain of repeating units (shown again in Figure 6c as n repeating units)."

The acid producing molecules are shown on page 15 line 18, page 17 line 4-12 (showing an acid content of .5-5%), page 19 line 17-22 and page 20 line 1-3. It is also shown in the original claims 34-36 and 38-43 which are incorporated into the specification by prior amendment which teach "creating an acid which can further catalyze the reaction"

"Aside from generating the acid environment, the silicate is converted to a hydroxyl form 30 (postulated) which forms a chain as shown at 32 which in proximity to the hydroxyl groups coming off of the cellulose ring units 34 reacts to form the silicate structure."

"Boron may be added as boric acid to the formula effectively in the range of .5 to 5% and is trapped in the silicone matrix. Alternatively, a reactive boron reagent of the type discussed above may be used to form a boron matrix such as that disclosed in Figure 10 when used in conjunction with a reactive silicate."

"In this structure, the acid is in very low concentration (in the case of methyl trichloro silane approximately .5%) to the silicone main donor, in this case octyltrimethoxysilane (MTS) or it=s equivalent. This is significant for many reasons, not the least of which are the limitation of the acidity of the end products, the minimization of expensive reactants, the safety of the solution and the lack of toxic emissions."

"Since water in the solution is particularly excluded or limited p. 28 line 12-14, all of the water driven reactions are seen to occur by reaction with water within the wood p.15 line 13-14; p. 17 line 6-12 and 23 line 2 for example."

"Water is also a solvent used in some cases. Water may be used with this formulation as an alternative to part of the organic solvents in certain formulations. Water may not work as well because it would compete with water in the wood unless a slower reaction was desired."

"HCl molecules providing an acid environment for catalyzing the reaction of the silicate with the hydroxyl group. This reaction draws the reactants into the wood and allows for a greater penetration of the wood of the treatment. Aside from generating the acid environment, the silicate is converted to a hydroxyl form 30 (postulated) which forms a chain as shown at 32

which in proximity to the hydroxyl groups coming off of the cellulose ring units 34 reacts to form the silicate structure."

The reaction is enhanced by water within the wood..

Applicant Response To Rejections Under 35 U.S.C. 102(b):

Introduction

Each of the independent claims, recite common elements, for example:

1. organic solvents defined in the claims as organic solvents allowing the solutes to be drawn from the solvent into the wood

2. non-oligomerized reactants are taught to the extent the solutes are drawn not oligomers,

3. covalently bonding the solute compound to the hydroxyl groups of the wood cellulose, ans

Additionally recited claim elements may include:

4. a reaction initiated without adding heat prior to the hydrolyzing of the acid using water in the wood;

5. allignment of the bonding atoms with the wood cellulose matrix during the bonding process;

6. the use of catalysts (created in situ using water in the wood cellulose to hydrolyze the acid in the solvent) for driving the reaction.

Applicant's claims are distinguished over each of the cited documents individually and in combination. Traverse in this regard is presented in detail below. Thus, Applicant respectively submits that none of the cited documents whether considered individually or in combination disclose, teach, suggest or motivate Applicant's claimed invention which utilizes an

organic solvent where reaction does not occur outside of the wood and where the solute and acid react with the water and hydroxyl groups of the wood cellulose forming covalent bonds without initiating heat.

Thus, Applicant submits that the claimed invention is not anticipated and is not obvious over the cited documents. Applicant respectfully requests that all rejections under 35 U.S.C. 102 and 103 be withdrawn.

II. **NEW PRIOR ART CONSIDERED**

In case number 10/274,057, the examiner cited additional authority relevant to this patent application for discussion purposes in the form of Liu et al., Chinese Journal of Polymer Science, 18(2), pages 161 B168, 2000.

Without waiving priority claims to the invention being prior to the date of the Liu patent, it is specifically pointed out that there is very little that the patent application has in common with the article.

The Liu patent didn't involve the treatment of wood, but instead involved the treatment of purified cellulose. Kelsoe's process does not have a prior requirement of preparation to make a homogenous solution to treat with a saline agent.

This is just one method of reducing hydroxyl groups in cellulose, but it doesn't teach any way in order to have a reaction where liquids in the wood draw reactants into the wood since there is no wood, just cellulose in a dish.

The dissolution of and purification of cellulose and the treatment of the resulting silanes under heat and pressure which is discussed in Liu, a temperature between 100 and 120 degrees using lithium chloride, has almost nothing to do with the solvent / water driven reaction which is

discussed in the patent. Liu is considered next to irrelevant and is no way being suggested to be combined with the wood treatment technology which is otherwise cited.

If anything the failure of Liu to take the inventive step of saying "the addition of specific solvents with the other chemicals could be applied to raw wood in order to make a reaction involving the release of heat and the drawing of reactants from the carrier solvent into the wood using the water in the wood" is indicative that Liu has nothing to do with the invention herein other than that there is the use of an acid and cellulose is utilized in the reaction.

OTHER DIFFERENCES IN THE PRIOR ART

Applicant's claimed invention does not require "stuffing" pores in the wood of the type required by hydrophobic silicone formulations which are available as emulsions or slurry. The claimed invention recites a solution which penetrates wood through migration from a solvent into the wood and which reacts with wood cellulose. Applicant asserts that none of the cited documents disclose treatments that would form permanent bonding of the interior and surface of the wood (or wood products), spontaneously, by contact.

Applicant is claimed invention is also distinguished by incorporating a soluble boron reagent into the formulas that would react with wood cellulose and lignins in a manner similar to silicon; thus forming a silicon-boron matrix in the wood further contributing to termite protection and fire retardancy. The cited prior art infusing unreacted boron acids into the wood without fixing those in the wood using a covalently bonded shield are easily distinguished.

Applicant's solvents are non-reacting.

Exposure of wood to neat MTS may be dangerous due to excessive formation of gaseous hydrochloric acid that may hurt handlers and degrades wood. Exposure to neat trimethylborate

may result in excessive drawing in of moisture by the treated wood from the environment because of the ***hygroscopic conditions that would exist***

Applicant's claimed invention is distinguished over the use of the non-hydrophilic solvents (such as gas and benzene). The cited documents do not disclose Applicant's claimed invention. Such disclosures teach away from Applicant's invention since protection of the wood is the desired end result.

Item 8.

Exothermic is replaced in the claims with heat generating. The specification discloses:

"Heat from the reaction will add pressure which will increase the saturation. The release of pressure and heat will indicate a completed reaction."

"Heat and pressure generated by the reaction, for example, between the methyl trichlorosilane could build. When the pressure drops, indicating that the heat generated by the reaction is ended or after a set period time if the wood is not to fully be treated, then the wood would be taken out of the solution." See page 16 line 23 and page 17 lines 1-4.

Also see page 22 lines 4-6.

The solute being unreacted is shown on page 29 line 1 and 2; page 28 line 3-4 and line 12.

"In some cases the solvent and additive may react in order to form a gel and in some cases it might be useful to agitate the solution in order to prevent that."

"SOLVENT: The solvent can vary tremendously also although it is preferably a non water based solvent so as not to cause a reaction or minimal water compound."

See also page 17 lines 4-12.

The words procatalyst and non-procatalyst do not appear in the specification as such. To address this, pro-catalyst is replaced with acid or base generating.

However, procatalyst is defined in the claims and specification as a substance which generates an acid utilizing the following language:

"a molecule producing an acid or base in the presence of wood cellulose or water in wood cellulose."

This same language is used in claim 82 and it would be redundant to delete a "procatalyst", but the changes shown in claims 119 as previously suggested have been entered.

AFFIDAVITS

The examiner suggested comparative tests which have be submitted in the companion case '165 but not considered in light of the additions in this specification and the examination of those tests to prove novelty and non-obviousness is one purpose of filing this continuing specification.

Applicant Additional Traverse Distinguishing Over Cited Documents

Saka

Claims 46-53, 55-57, 61, 63 and 65-68 have been rejected under 35 U.S.C. 102(b) as being anticipated by Saka.

Applicant discloses covalently bonding the claimed compound to the wood cellulose throughout the wood by means of hydroxyl replacement in a reaction in a solvent, acid, catalyst, reactant combination which on contact with wood allows the catalyst and reactant solutes to be pulled by the reaction into the wood thereby generating a heat reaction.

Saka discloses a different technology and process than that claimed by Applicant.

Applicant claims

1. organic solvents defined in the claims as organic solvents allowing the solutes to be pulled from the solvent into the wood

2. non-oligomerized reactants;

3. covalently bonding the solute compound to the hydroxyl groups of the wood cellulose, and

4. bonding molecules of said solute compound to one another.

Additionally recited claim elements may include:

5. a reaction initiated without adding heat prior to the hydrolyzing of the acid using water in the wood;

6. alignment of the bonding atoms with the wood cellulose matrix during the bonding process;

7. the use of catalysts (created in situ using water in the wood cellulose to hydrolyze the acid in the solvent) for driving the reaction.

Saka teaches the creation of an oligomer and impregnating of wood with a solution of a methylsiloxane oligomer containing phosphorus and/or boron. (*see* Saka, col. 2, lines 23-52).

Saka teaches away from functional disclosure by eliminating the reactive monomers which are used to form the cyclic rings on the matrix defined by the cellulose as shown in the Figures 6a and 6b.

Saka fails to react exothermically for several reasons, one of which being that the oligomers cannot line up with the atoms in the wood easily because of the need to structurally align the oligomer and because the oligomer is non-reactive without heat and pressure.

After creation of the oligomer, Saka engages in a three step process which involves impregnation followed by subsequent hydrolysis or pyrolysis and then a following

polycondensation reaction. Saka teaches a preferred embodiment by impregnating wood with a methylsiloxane oligomer containing phosphorus and/or boron and a silicon atom having at least two methyl groups directly attached thereto, subjecting the oligomer within wood cell voids to hydrolysis or pyrolysis and effecting polycondensation, there is formed a phosphorus oxide and/or boron oxide which is chemically bound in a water repellent methylsilicone resin and a cured product or gel thereof. (*see* Saka, col.3, lines 20-36).

Because Saka forms oligomers outside of the wood, the practical affect is to stop the spontaneous reaction by trying to force chains, as opposed to individual one reactant trivalent, tetravalent or pentavalent atom molecules, in alignment with the cellulose. By conducting this reaction within the wood, applicant creates his bonding product on a template defined by the wood thereby ensuring alignment of short compounds.

Saka prevents this formation by making the oligomers outside of the wood.

As shown in Claim 61, in the applicant's patent, the initial covalent bonds are aligned with the wood cellulose to which they bond.

Saka's recitation of "in cell walls" refers to voids in the wood (*see* Saka, col. 3, lines 20-36). The Saka technology fills the gaps and voids in wood with the disclosed oligomer or oligomer solution, but no reaction occurs with the cellulose upon the filling of the void of the wood. This is evidenced in Saka's disclosure:

"Next, the wood impregnated with the methylsiloxane oligomer and aged is dried at a temperature at which the wood does not undergo pyrolysis, preferably 50 degree to 110 degree C " (*see* Saka, Col. 5, lines 1-14).

Saka states "wood impregnated with the methylsiloxane oligomer and aged is dried at a temperature at which the wood does not undergo pyrolysis". Thus Saka teaches away from

Applicant's invention; and states that no reaction occurs upon impregnation; does not teach an exothermic reaction; and is a different technology than Applicant's claimed invention. Not only does Saka not teach all of the elements of Applicant's claimed invention, Saka two step process does not teach, motivate, suggest or predict the likelihood of success of Applicant's claimed invention.

Further, and different from Applicant's claims reciting applying said solution to wood cellulose; and pulling solutes with a reaction with water in the wood cellulose to covalently bond", Saka discloses that after impregnation, the oligomer is subject to hydrolysis or pyrolysis, which is then followed by a polycondensation reaction (resulting in curing of the oligomeric treatment). "As a result, a methyl-silicone resin containing incombustible phosphorus oxide and/or boron oxide is formed in cell walls" (*see* Saka, col. 2, lines 52-57). Again, Saka's recitation of "in cell walls" refers to voids in the wood (*see* Saka, col. 3, lines 20-36).

Saka discloses "In the drying step, the oligomer cures through hydrolysis or pyrolysis and subsequent polycondensation, converting into a methylsilicone resin containing phosphorus oxide and/or boron oxide. The hydrolysis step may be promoted by an acidic or basic catalyst, metal organic acid salt or organometallic compound or a mixture of such catalysts. Typically, wood is impregnated with a methylsiloxane oligomer solution, kept therein for about 1 to 7 days under a vacuum of 10 to 15 mm Hg at room temperature, taken out of the solution, allowed to stand at room temperature for about one day, and heat dried at 50.degree to 110 degree C for about ½ to 2 days." (*see* Saka, Col. 5, lines 1-14).

After, and separate from, Saka impregnation of the wood voids, Saka teaches a reaction of hydrolysis or pyrolysis that is followed by a polycondensation reaction. Saka process

requires preferably 50 degree to 110 degrees C A (*see* Saka, Col. 5, lines 1-14). These conditions support the reaction series which occurs separately from and after impregnation.

With regard to Saka's different reaction, the disclosure teaches that whether it is Saka's formula (1) or (2) [(1) $(CH_3SiO_{3/2})_m(MO_{3/2})_n$; (2) $[CH_3SiO_{3/2}]_x[(CH_3)_aSiO_{(4-a)/2}]_y[MO_{3/2}]_z$ (*see* Saka, col. 2, lines 23-52)], The oligomer is terminated with a hydroxyl group and/or an alkoxyl group of 1 to 4 carbon atoms. (*see* Saka, col. 4, lines 12-19). Saka goes on to teach that preferably the methylsiloxane oligomer has an average degree of polymerization of 2 to 50, preferably 2 to 20 (*see* Saka, col. 4, lines 20-21). Saka's Example 1 discloses an average degree of polymerization of about 4 and was terminated with a methoxyl group (*see* Saka, col. 5, lines 35-36), while Saka's Examples 2, 3, 4, 5, 6 and 7 recite an average degree of polymerization of about 6 and was terminated with a methoxyl group and a hydroxyl group (*see* Saka, col. 6, lines 43-44, col. 6, lines 66-67, col. 7, lines 26-27, col. 8, lines 1-2, col. 8, lines 28-29, and col. 8, lines 28-29).

Applicant's reaction employs different reactants and a different mechanism for employing the reactants.

Saka teaches a chemistry in which the reaction does not involve wood cellulose and water as a reactant. Further, the reaction does not employ the wood cellulose as a means to terminate Saka's reaction. Saka's reaction occurs by means apart from the wood. Applicant's claimed invention employs a different principle of operation, different chemistry and different process steps from those disclosed by Saka or any of the other cited documents.

Thus, there is no *prima facia* case of anticipation and no *prima facie* case of obviousness over Saka or any combination of references including Saka. Applicant respectfully requests that

the rejections under 35 U.S.C. ' 102 and 103 over Saka alone or in a combination including Saka be withdrawn.

Applicant respectfully submits that the process recited by Saka is different from Applicant's claimed invention. Saka technology uses impregnation of wood with a methylsiloxane oligomer which contains phosphorous and/or boron. These are high molecular weight co-polymers that need to be prepared separately (outside the wood) from trialkoxysilanes and other reagents by heating and diluting. Differently, the material to be applied to wood is not an alkyltrialkoxysilane, but a pre-prepared copolymer of unknown composition. The wood to be treated under Saka will have to be moisture conditioned first by soxhlet extraction with acetone, a very expensive procedure, followed by exposure to moisture to achieve the desired water content. This conditioned wood is then dipped for three days in the oligomer formula in methanol under vacuum. Essentially the oligomer is forced to be drawn into the pores of wood by mechanically applied vacuum and the methanol is simultaneously removed.

No significant instant reaction and covalent bond formation occur with Saka. Instead, the wood undergoes heat treatment at 65 degrees for one day and then at 105 degrees for another day. This wood had a weight gain of 11.3%; however on exposure to water for four hours silicon was leached out indicating that the silicon is not bonded to the wood in spite of prolonged and expensive curing of the wood at high temperatures after treatment. Applicant claims an exothermic reaction resulting in covalent bonds. Saka forces the creation of oligomers prior to the application of Saka mixture of the wood. Saka technology does not function in the manner of the invention claimed by Applicant. Applicant's solution is stable and does not experience reaction prior to application to the wood. Saka's technology of using the silicon oligomers

(prepared separately outside the wood) followed by curing the wood at high temperatures to obtain fire retardency is not similar or pertinent to the technology recited in this application.

Applicant respectfully submits that Saka does not disclose expressly or inherently all of the elements of Applicant's claimed invention. Further, there is no teaching, suggestion or motivation to practice Applicant's claimed invention. Thus, Applicant respectfully request the withdrawal of the instant rejection under 35 U.S.C. 102(b) over Saka.

Maciejewski

Claims should not be rejected under 35 U.S.C. 102(b) over Maciejewski.

It is alleged that Maciejewski teaches treating wood with methyltrichlorosilane in an organic solvent such as toluene.

Like Saka, Maciejewski teaches the use of a mixture of methylsiloxane, phenylsiloxane and vinyltrichlorosilane in toluene with subsequent curing to make a coating on metal, concrete or wood. The mechanism of this coating involves co-polymerization of the vinylsilane with the siloxanes on curing on the surface of the metal, concrete or wood. The reagent does not react with the metal, concrete or wood but forms a coating on the surface only.

Toluene disclosed by Maciejewski is a hydrophobic solvent. It repels water and consequently cannot penetrate or allow penetration into the wood unless the wood is dried. As such, the coating occurs only on the surface, whereas Applicant claimed invention claims a hydrophilic organic solvent which contains a claimed compound which reacts with wood.

Applicant further asserts that Maciejewski's expedient of using tri-methylborate (or as cited in paragraphs 10 and 11 trimethylborate or methyltrichlorosilane) to treat wood does not disclose the recitations of Applicant's claims which recite an organic solvent to dilute the

reactants which allows the solute to react with "water in the wood cellulose" and to carry out the reaction where the reactants are pulled from the organic solvent to the wood.

The use of straight methyltrichlorosilene or similar reagents would damage the wood and leave damaging amounts of reagents in contact with the wood or the environment. In contrast, Applicant's claimed invention results in a covalently bonded product, not harmful to the wood, with little or no waste in contact with the wood or environment.

Applicant respectfully submits that the technologies described in the application and the cited prior art are different in both composition and mechanism of action. In view of the above, Applicant respectfully requests the withdrawal of the instant rejection under 35 U.S.C. 102(b).

Nasheri

Claims 46-49, 61, and 65-66 have been rejected as allegedly anticipated under 35 USC 102(b) over Nasheri.

The disclosed Nasheri technology is fundamentally different from the exothermic reaction as claimed by Applicant.

As shown in the amended claims and as taught by Nasheri, without a catalyst a (strong acid directly added or made within the wood, or by a strong acid generated upon exposure to water Nasheri does nothing more than put boric acid in the wood. This would be a step which would be done prior to the claimed invention of Applicant (See original claims 39 and 40).

Nasheri does not disclose the reaction claimed by Applicant. It does not use an activator to activate simultaneously the silicon and boron additive for reaction with the hydroxyl groups of wood molecules. Nasheri does not teach a method of bonding the boron atoms to cellulose and as to one another as claimed by Applicant.

Applicant's claimed invention recites trivalent (such as boron) and tetravalent (such as silicon) reactions, where the claimed atoms are bonded to a halogen atom or bonded to a functional group selected from the group consisting of a hydroxyl group, alkoxy group, etc. Such recitations do not appear to be disclosed by the cited documents.

While Nasheri may add 1% Boron to wood, there is no disclosure of the covalent reaction of boron analogous to the reaction of Applicant's claimed solutions bonded to the claimed functional groups, (or silicone or any other specified atoms) to the wood, nor does Nasheri teach covalently bonding to the wood and to one another

Nasheri introduces the boron product through drying the wood so that the wood absorbs the liquid mixture as opposed to the process which is disclosed by Applicant which uses the moisture in the wood to draw a reactive compound out of solution. The exothermic reaction claimed by Applicant is also not disclosed, taught or suggested by Nasheri.

Nasheri technology needs the wood to be dried prior to treatment and does not provide a technology to bond boron to wood that would not leach out. Further, Nasheri technology does not provide a method to simultaneously bond both boron and silicon to wood at points of contact of both dry and wet wood without pre-treatment.

Applicant respectfully submits that not all of Applicant claimed elements are disclosed by Nasheri. Further, the reference teaches away from Applicant claimed invention. Thus, Applicant respectfully requests that the instant rejection under 35 U.S.C. 102(b) be withdrawn.

Stabnikov

Claims 46, 59, 61, 65 and 70 have been rejected under 35 U.S.C. 102(b) as allegedly anticipated by the study described in the Stabnikov publication.

Applicant claimed solution is hydrophilic and the reagents are drawn in to the interior of wood and treats all parts of wood.

The Applicant respectfully submits that the formula used by Stabinikov for Water-repellency treatment of lumber is different from Applicant claimed invention. For example Stabnikov discloses:

A single reagent methyltrichlorosilane in gasoline.

Gasoline is a solvent that is hydrophobic, and gasoline is repelled from wood containing moisture and therefore cannot penetrate the wood.

The Stabinikov formula does not provide moisture preservation and Stabnikov concludes that the results are not complete and does not affirm that the given problem has been resolved.

Applicant claimed invention comprises a stable mixture of an activator, a silicon reagent and a boron reagent in a hydrophilic organic solvent that is not repelled by wood moisture. Unlike Stabnikov disclosure which treats wood only on the exterior due to hydrophobicity of the gasoline based formula.

There are differences in the chemical composition of Applicant's claimed formula and the claimed mechanism of treatment. Further, the cited document is not conclusive and teaches away from Applicant's claimed invention by not providing a formula which has solutes drawn from the solution by the water on the wood. Thus, Applicant respectfully requests that the instant invention under 35 U.S.C. 102 be withdrawn.

Applicant Response to Rejections Under 35 U.S.C. 103:

The establishment of a *prima facie* case of obviousness requires that the cited document(s) must teach or suggest all claimed elements of Applicant's claimed invention, there must also be a suggestion or motivation to modify or combine references to achieve the claimed invention, and there must be a

reasonable expectation of success to practice the claimed invention. The cited document(s) must not teach away from Applicant claimed invention.

With the exception of claim recitations directed toward ultrasonics where Meyers (US 3,682,675) is cited as a secondary document, the rejections under 35 U.S.C. 103 are based upon the same references applied under 35 U.S.C. 102(b).

As discussed above, each of the independent claims, 54, 60 and 62, recite common elements which include, for example: special properties in the solvent, reacting said compound or covalently bonding said compound via *in situ* generated heat, covalently bonding the solute compound to the hydroxyl groups of the wood cellulose, and molecules of said solute compound are covalently bonded to one another. The new claims show how the use of monomers in an organic solvent clearly differentiate the technology herein from the technology in the prior art and show why the results of this reaction are so much more pronounced. The variation from neat MTS to catalysed reactions with pro-catalysts is a further distinguishing feature, but is not necessary in view the need for the organic solvents to be allow the solutes to be drawn out.

As discussed above none of the cited references alone or in combination teach, disclose or suggest all of Applicant's claimed elements. Therefore a *prima facie* case of obviousness does not exist. Thus, Applicant respectfully requests that all rejections under 35 U.S.C. 103 be withdrawn.

REJECTIONS

Saka or rejected under 35 U.S.C. 103(a) as being unpatentable over Saka in view of Meyers (US 3,682,675).

As discussed above, Saka fails to disclose all of the elements of Applicant's claimed invention. Further, Saka does not teach, motivate or suggest Applicant's claimed invention.

Saka avoids, intentionally, the use of monomers and teaches away from such a use. Saka fails to create a non-water based organic solvent. Saka fails to use acid creating a drawing of solutes into the wood from an appropriate solvent.

Meyers does not remedy the deficiencies of Saka (*see* discussion of Meyers below).

Thus, no *prima facie* case of obvious has been established and Applicant respectfully requests the withdrawal of the instant rejection under 35 U.S.C. 103.

Nasheri In View of Meyers

Claims 60 and 62 were rejected under 35 U.S.C. 103(a) as allegedly unpatentable over Nasheri or rejected under 35 U.S.C. 103 over Nasheri in view of Meyers.

As submitted in connection with the 35 U.S.C. 102(b) rejections wherein Nasheri is cited, the Applicant claimed invention differs from the cited documents.

The Nasheri concentrations of boric acid do not make obviousness the process claimed by Applicant, e.g., as discussed above, Applicant asserts that the boron in Nasheri is not covalently bonded to the wood cellulose in the manner claimed by Applicant and to other molecules or compounds as claimed by Applicant.

Applicant claims recite that certain additives; e.g., boron (a insect treatment); may be locked into the wood using Applicant's claimed invention which would increase the percent boron by weight, but not the percent boron reacted by weight.

This highlights a fundamental difference of Applicant's claimed invention which involves the cross linking of molecules across cellulose hydroxyl atoms with, for example, boron compounds, not the introduction of acid into the wood as is the sole outcome of the Nasheri invention. The introduction of boron in this way is considered, but only as a pre-cursor to treatment with the inventive process which would lock these boron compounds into the wood.

Meyers does not remedy the deficiencies of Nasheri (*see* discussion of Meyers herein).

Thus, in view of the above, Applicant respectfully submits that no *prima facie* of obviousness has been established and that the instant rejection under 35 U.S.C. 103 be withdrawn.

Stabnikov

Stabnikov (see also Nasheri in view of Stabnikov).

As discussed above, neither Stabnikov nor Nasheri disclose all of Applicant's claimed elements. Combination of these documents does not disclose claim recitations such as covalent bonding or exothermic reaction. As discussed above, in addition to the deficiencies in the cited disclosures, these references also teach away from Applicant's claimed invention and do not predict any likelihood of success of Applicant's claimed invention.

Thus, Applicant respectfully requests that the instant rejections under 35 U.S.C. 103 be withdrawn.

Myers

The Myers patent relates to the flame retardency of wood products, and in particular wood panels. Myers disclosed flame retardency is preferably accomplished by immersing the panel to be treated in a hot solution, and is conducted in the presence of compressional energy. Myers appears silent with regard to the mechanism by which the treating agent interacts with the wood panel, except that they are infused. Because Myers is relying upon the addition of supplemental heat and compressional energy. Generally, Meyers does not disclose a reactive event. Infusion is different from reaction. Specifically, Meyers does not disclose Applicant's claimed reaction. Myers also does not disclose the claimed heat generating process of the claimed invention, covalent bonding via the hydroxyl groups of the cellulose.

Applicant claims the use of the chemicals covalently bonded with wood cellulose and water

within the wood in order to take the un-reacted Cellulose and react them creating acid as a part of the reaction, which is optionally catalyzed utilizing acid in conjunction with the claimed compound in order to have the cellulose react within the wood generating an exothermic reaction which is self-sustaining and facilitates deep penetration of the chemicals then would be possible without the addition of pressure and heat as is taught by the cited documents. The use of undiluted catalyst (such as methyltrichlorosilane), damages the wood when used on or leaves undesirable damaging concentrations of acid or other chemicals which may leach back into the environment.

In view of the above, Applicant respectfully submits that no *prima facie* case of obviousness has been established and requests withdrawal of the instant rejection.

Supplemental Traverse

The treatments disclosed by the cited documents do not appear to use the chemistry claimed by Applicant and further disclosed in Figure 7 and in the specification. Another difference between the presently claimed invention and the disclosure of the cited documents lies in the use of water, and cellulose and the wood cellulose as a reactant and covalently bonding Applicant's claimed compounds to the cellulose of the wood itself.

Saka discloses the beginning with methyl cellulose or oxygenated cellulose or oxygenated boron gels, which are readily dissolvable utilizing organic solvents which can be injected into wood and may react with the wood utilizing high temperature and along with the possible use of acids in order to enhance the reaction.

This process occurs external to the wood and its cellulose which is ultimately treated with the dissolved gel.

The present application teaches the use of chemicals which are applied to the wood and utilizing a catalyst in the form of acid or a reactant such as a halogenated compound such as

methyltrichlorosilane that are reacted with a water in the wood and in order to get the intermediary oxygenated cellulose which then immediately reacts with the hydroxide groups and the cellulose in order to polymerize the oxygen and silicon atoms in order to form chains directly on the wood cellulose. The dramatic and non-obvious result is that instead of having to utilize energy in order to generate the reaction, the reaction itself is self propagating and will in fact generate a limited controlled heat until the entire wood is treated or until the cellulose or compounds are used up.

Instead of requiring that the oxygenated chemicals be pushed into the wood under pressure leading to imperfect or irregular saturation, the reaction pulls in the chemicals as fuel for the chemical reaction so that penetration may be obtained at a much deeper and more even level.

Hence, one reason for using hydrophilic organic solvents is in order to prevent the oxygenation of the chemicals until they come in contact with the water within the wood. Hence, while similar individual chemicals may be found in both processes, the utilization of the chemicals is so diametrically apposed as to create the difference between an endothermic and an exothermic chemical reaction.

Since penetration, even treatment and energy conservation are primary goals in wood treatment, it becomes clear that the current process was not obvious in the disclosures of the cited documents or it would have been disclosed in the manner taught in the present invention.

The use of an exothermic reaction in order to combine silanes and boron to wood cellulose is not disclosed previously.

The Court of Appeals for the Federal Circuit has long held that it is impermissible to use the claimed invention as an instruction manual or template to piece together the teachings of the prior art so that the claimed invention is rendered obvious. The Court of Appeals for the Federal Circuit has made it clear, the prior art must teach the desirability for the modification. The mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the

desirability of the modification. In re Fritch, 972 F.2d 1260, 23 U.S.P.Q. 2d 1780 (Fed. Circ. 1992), citing In re Gordon et al., 733 F.2d 900, 221 U.S.P.Q. 1125, (Fed. Cir. 1984).

The subject matter of claims may not be considered obvious as a result of a hypothetical combination of references unless something in the references suggests that an advantage may be derived from combining their teachings. In this respect, the Court of Appeals for the Federal Circuit (hereinafter CAFC) has confirmed this point in In re Fritch, 972 F.2d 1260, 23 U.S.P.Q. 2d 1780 (Fed. Circ. 1992). The CAFC has clearly and consistently established the following mandate regarding hypothetical combinations of references:

Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. Under 35 U.S.C. 103, teachings of references can be combined only if there is some suggestion or incentive to do so. ACS Hosp. Systems, Inc. v. Montefiore Hosp., 732 F.2d 1572, 221 U.S.P.Q. 929 (Fed. Cir. 1984).

The CAFC has held that an Examiner should not rely upon hindsight to arrive at a determination of obviousness. It is impermissible to use the claimed invention as an instruction manual or template to piece together the teachings of the prior art so that the claimed invention is rendered obvious. One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention. In re Fritch, 972 F.2d 1260, 23 U.S.P.Q. 2d 1780 (Fed. Circ. 1992), citing In re Fine, 837 F.2d 1071, 5 U.S.P.Q. 2d 1596 (Fed. Cir. 1988).

In view of the above, Applicant respectfully submits that no *prima facie* case of obviousness exists. None of the cited documents, whether alone or in combination, teach or suggest all claimed elements of Applicant claimed invention. There is also no suggestion or motivation to modify or combine references to achieve Applicant claimed invention, and no reasonable expectation of success to practice Applicant claimed invention is provided. Thus,

Applicant respectfully request that all of the rejections set forth under 35 U.S.C. 103 be withdrawn.

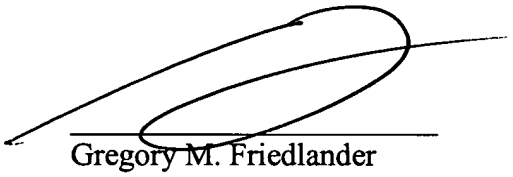
CONCLUSION

In view of the above, Applicant respectfully submits that no *prima facie* case of anticipation or obviousness exists and that the application is in condition for allowance. Applicant respectfully request the withdrawal of all rejections set forth under 35 U.S.C. 102 and 35 U.S.C. 103 and allowance of this application.

AUTHORIZATION

The Commissioner is hereby authorized to charge any fees which may be required for timely consideration of this Preliminary Amendment, or credit any overpayment to Deposit Account No. 06-2129.

Respectfully submitted,



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MARKED UP PARAGRAPHS

On page 24 lines 18-22, here is the paragraph marked up.

The basic structure of [the] a molecule used in the process described herein is [include]: $R\text{-}X_a\text{-}Xb_3$ or $R\text{-}R_3\text{-}X_a\text{-}Xb$ where R is a carbon compound, X_a is a tetravalent atom (which may be substituted with trivalent or pentavalent atoms and other embodiments), Xb is a [R is a carbon compound, Xa is a trivalent, tetravalent or pentavalent atom and Xb is a reactive seven valence] halogen (fluorine, chlorine, bromine, etc.) or their equivalent.

On page 28 lines 3-4 here is the paragraph marked up:

SOLVENT: The solvent can vary tremendously also although it is preferably a non water based solvent so as not to cause a reaction or minimal water compound [so it is not going to cause It would typically be structured so as not to effect the glue or other properties of wood composites].

Appendix I

Please replace the paragraph objected to with the following:

"SOLVENT: The solvent can vary tremendously also although it is preferably a non water based solvent so as not to cause a reaction or minimal water compound."

72. A process for treating wood having wood cellulose having a plurality of hydroxyl groups comprising the steps of:

~~providing a solution consisting essentially of a non-water-based hydrophilic~~water compatible organic solvent and a dissolved solute having a functional group comprising an atom selected from the group consisting of trivalent, tetravalent and pentavalent atoms, wherein said atom is bonded to a halogen atom or a functional group selected from the group consisting of a hydroxyl group, alkoxy group, phenoxy group, benzyloxy group and an aryloxy group having a polycyclic aromatic ring,

~~and wherein the organic solvent is further defined as allowing the~~ solutes to be drawn from the solute into the wood;

adding a catalyst reacting with water in the wood to produce an acid;

applying said solution to the wood ~~cellulose,~~

~~;~~

drawing the catalyst and solute into the wood;

reacting the catalyst with the water in the wood to produce a solvated acid;

covalently reacting said functional groups ~~upon said applying~~using ~~to said wood~~he solvated acid with the cellulose.

73. The process according to claim 76 wherein the solutes are monomers and further comprising the steps of simultaneous reaction and diffusion of the monomers in the wood.

74. The invention of claim 72 wherein ~~said reacting is exothermic.~~

~~heat is generated by the solutes and acid reacting with the cellulose.~~

75. The process according to claim 72 wherein the ~~reaction is self-initiating~~process of drawing further comprises water in the wood pulling the solutes into the wood while simultaneously reacting the water with the acid and reacting

the cellulose with the solute.

~~76.~~ The process of claim 72 wherein the solute is comprised of monomers prior to application of the solute to said wood.

77. The process of claim 72 wherein the ~~process further comprises the step of adding a~~ catalyst ~~to the~~is less than 10% by mass of the entire solution.

78. The process of claim 7~~7~~2 wherein the step of ~~adding a catalyst~~covalently reacting further comprises the ~~set~~step of catalytically bonding the functional group tetravalent atom across an oxygen of the cellulose ~~hydroxyl group.~~

~~80. The process of claim 78 wherein the catalyst is added to the solution prior to application of the~~base catalyst.

80. A process for treating wood having wood cellulose having a plurality of hydroxyl groups comprising the steps of:

providing a solution consisting essentially of a water compatible organic solvent and a solute having a functional group comprising an atom selected from the group consisting of trivalent, tetravalent and pentavalent atoms, wherein said atom is bonded to a halogen atom or a functional group selected from the group consisting of a hydroxyl group, alkoxy group, phenoxy group, benzyloxy group and an aryloxy group having a polycyclic aromatic ring, and wherein the solvent is further defined as allowing the solutes to be drawn from the solute into the wood;

adding a catalyst reacting with water in the wood to produce a base;

applying said solution to the wood;

drawing the catalyst and solute into the wood;

reacting the catalyst with the water in the wood to produce a solvated base;

covalently reacting said functional groups using the solvated base with the cellulose.

81. The process of claim 7~~8~~2 wherein the ~~catalyst~~acid is ~~an~~a strong acid ~~or a base~~.

82. The process ~~of~~according to claim 8~~1~~0 wherein the ~~acid is produced by a molecule producing an acid in the presence of water in wood.~~

~~83.~~solutes are monomers and further comprising the steps of simultaneous reaction and diffusion of the monomers in the wood.

83. The process of claim ~~82~~77 wherein the ~~acid~~catalyst is in the range of 0.1-10% of the solution.

84. The process of claim 83 wherein the ~~acid~~catalyst is in the range from 0.1 to 4.9% of the solution.

85. The process of claim 81 wherein the acid is selected from the group consisting of acids from alkyl-halide monomers with trivalent, tetravalent and pentavalent atoms.

86. The process of claim 8~~2~~5 wherein the ~~molecule~~acid is ~~a molecule~~ comprised of silicon and a halogen.

87. The process of claim ~~82~~72 wherein the ~~functional groups comprises a molecule producing an acid~~solute comprises a non-catalyst producing, molecule which reacts to covalently bond with wood cellulose in the ~~presence of water in wood cellulose and a molecule which does not produce an acid in the presence of water in wood cellulose that reacts exothermically on application to wood at standard atmospheric temperature and pressure.~~ presences of acid from the catalyst.

88. The process of claim 8~~2~~7 wherein a molecule which does not produce an acid in the presence of water in wood cellulose reacts ~~exothermically~~to produce heat with wood cellulose in the

presence of ~~a~~the molecule producing an acid in the presence of water in wood cellulose.

~~———~~ 89. The process of claim 8~~2~~8 wherein the ~~non-catalytic reagents would include~~non-acid producing molecule is from the group consisting of alkyl and hydroxyl or alkoxy bonded trivalent, pentavalent and tetravalent atoms and combines thereof.

90. The process of claim 85 wherein the catalyst is from the group consisting of hydrochloric, meta-phosphoric acid, poly-phosphoric acid, ~~bases from metal alkoxides and~~ Phosphoric acid, and combinations thereof.

91. The process of claim 85 wherein the acid is in the range of 0.01-10% *in situ*.

92. The process of claim 72 wherein the process further comprises avoiding ~~the~~water based formation of oligomers of the functional groups prior to applying said solution to said wood.

93. The process of claim 72 further comprising the step of:

adding at least one non-reactive additive to the wood cellulose that enhances a desired property selected from the group consisting of:

fire resistance,

insect resistance,

moisture resistance

color,

adhesion, and

insulation, and

combinations thereof.

94. The process of claim 93 wherein the step of adding at least one non reactive additive further comprises adding the additive to the solution.

~~94~~5. The process of claim 93 wherein the step of adding ~~at least one non reactive additive further comprises adding the additive to the solution.~~

~~95. The process of claim 93 wherein the step of adding~~ the at least one ~~non-reactive~~ non-reactive additive occurs before reacting the functional groups to bond with the wood ~~—~~cellulose.

96. The process of claim 93 wherein the additive is selected from the group consisting of:

diatimatious earth,

sodium silicates,

boron or silicon salts,

boric acid,

trimethy (trialkyl) borate,

Boron Halides (BF3, BCl3, etc.),

Boric Anhydride (boron oxide),

phosphorous compounds,

copper compounds,

metal alkoxide,

meta-phosphoric acid;

a hydrophobic reagents,

phosphoric acid, and

metaphoshoric acid,

and combinations thereof.

97. The process of claim 72 wherein the solute compound comprises functional groups selected from the group consisting of ~~R-Xa-Xb~~$_3$R-X_a-Xb_3, ~~R3-Xa-Xb~~R_3-X_a-X_b, ~~R2-Xa-Xb~~$_2R_2$-X_a-Xb_2, ~~R4-Xa~~R_4-X_a, and ~~XaR3~~X_aR_3 wherein R is an alkyl or a combination thereof, ~~Xa~~X_a is a trivalent, tetravalent or pentavalent atom or a combination thereof and ~~Xb~~X_b is a halogen or alkoxy or hydroxyl group or combination thereof.

98. The process according to claim 72, wherein the wood cellulose has an original weight and wherein the duration of treatment attains a weight of compound which is covalently bonded to the wood cellulose in a range of 0.1 to 10 weight percent of the original weight of the wood cellulose.

99. The process according to claim 72, further comprising forming cyclic interlocking molecules having as a part of the cyclic structure containing at least two carbons within the cellulose and at least two of the atoms from the functional groups consisting of trivalent, tetravalent and pentavalent atoms.

100. The process of claim 81 further comprising the step of exposing the acids introduced into the wood to an acid neutralizing agent subsequent to the treatment.

101. The process of claim 81 further comprising the step of introducing an acid neutralizing agent into the wood prior to the exposure of the wood cellulose to the acid.

102. (CANCELLED)

103. (CANCELLED)

104. A process according to claim 72 wherein the wood cellulose is not dry and wherein the step of drawing further comprises solvating the functional groups ~~are solvated~~ by the water in the wood prior to being covalently bonded to the hydroxyl groups of said wood cellulose.

105. The process according to claim 72 further comprising the step of adding water to the wood cellulose prior to applying the solution to the wood cellulose.

106. A process for treating wood cellulose containing water, said cellulose having a plurality of hydroxyl groups comprising the steps of:

providing a solution comprised of a ~~non-water-based hydrophilic~~water compatible organic solvent and a solute having a plurality of ~~monomers~~unreacted solutes comprising an atom selected from the group consisting of tri-valent, tetravalent and pentavalent atoms, wherein said atom is bonded to a halogen atom or a functional group selected from the group consisting of a hydroxyl group, alkoxy group, phenoxy group, benzyloxy group and an aryloxy group having a polycyclic aromatic ring, applying said solution to the wood cellulose; and simultaneously ~~diffusing~~pulling said solution into the wood using the water within ~~said~~the wood and reacting said solute to form covalent bonds, ~~and forming~~and forming a matrix structure comprising reacted monomers and wood cellulose.

107. The process of claim 106 further comprising the step of:

adding at least one non-reactive additive that enhances a desired property selected from the group consisting of:

fire resistance,

insect resistance,

moisture resistance

color,

adhesion, and

insulation, and

combinations thereof.

108.– The process of claim 107 wherein the step of adding the at least one non-reactive additive occurs before covalently bonding the compound to the wood cellulose.

109. Cancelled.

110. The process according to claim 106, further comprising a step of exposing the wood to ultra-sound sonification while applying said solution.

111. A process for treating wood cellulose, in wood having water in the wood having a plurality of hydroxyl groups comprising the steps of:

providing a solution comprised of a ~~non-water-based hydrophilic~~water compatible organic solvent; ~~a molecule which produces~~ an acid ~~in the presence of water in~~; an atom selected from the group consisting of tri-valent, tetravalent and pentavalent atoms, wherein said atom is bonded to a halogen atom or a functional group selected from the group consisting of a hydroxyl group, alkoxy group, phenoxy group, benzyloxy group and an aryloxy group having a polycyclic aromatic ring, applying said solution to the wood cellulose; solvating the acid with the water in the wood to produce a solvated acid and reacting the atom with the solvated acid and the wood cellulose ~~diffused as a chemical from the solution and bonding with wood in conjunction with water in the wood and generating in the bonding a catalyst; and a molecule not producing an acid in the presence of water in wood cellulose diffused as a chemical from the solution and bonding with wood cellulose in the presence of the catalyst generated by the molecule producing an acid in the presence of water in wood cellulose.~~

~~112~~to produce heat and a silicone cellulose bond.

112. The process of claim 111 wherein the step of reacting further comprises the step of pulling the atoms from the solvent into the wood.

113. The process of claim 111 wherein the ~~catalyst is an acid produced by the molecule which produces an acid in the presence of water in the wood cellulose is defined as a molecule producing an acid causing a spontaneous reaction of the molecule producing an acid in the presence of water in wood cellulose.~~

~~113. The process of claim 112 wherein the acid or a molecule which produces an acid in the presence of wood cellulose~~acid is in the range of 0.1-10% of the solution.

114. The process of claim 112 wherein the ~~acid or~~ molecule which produces an acid in the presence of wood cellulose is in the range from 0.1 to 4.9% of the solution.

115. The process of claim 112 wherein the acid is selected from the group consisting of acids from alkyl-silicon halides, acids from alkyl-halide monomers with trivalent, tetravalent and pentavalent atoms, hydrochloric, meta-phosphoric acid, poly-phosphoric acid, [bases from metal alkoxides] and Phosphoric acid and combinations thereof, wherein the ~~acid [or base]~~ is in the range of 0.01-10% *in situ*.

~~116.~~ The process of claim 112 wherein a molecule which produces an acid in the presence of water in wood cellulose is a molecule comprised of silicone and a halogen.

~~117.~~ The process of claim 112 wherein a molecule which does not produce an acid in the presence of water in wood cellulose reacts exothermically and spontaneously with wood in the presence of a molecule which does produce an acid in the presence of water in the wood cellulose.

~~118.~~ The process of claim 112 wherein the molecule which does not produce an acid in the presence of water in the wood cellulose would include hydroxyl and alkoxy bonded tetravalent atoms.

(New Claim) 119. The process of claim 81 wherein the acid is produced by a molecule producing an acid in the presence of water in wood.

120. The process of claim 119 wherein the acid is in the range of 0.1-10% of the solution.

121. The process of claim 119 wherein the acid is in the range from 0.1 to 4.9 % of the solution.

122. The process of claim 119 wherein the molecule is a molecule comprised of a metal and a halogen.

123. The process of claim 120 wherein the functional group comprises a molecule being drawn from the into the wood from the organic solvent and therein producing an acid in the presence of water in wood cellulose and wherein the acid and solute reacts producing heat on application to wood at standard atmospheric temperature and pressure.

124. A process for treating wood cellulose having a plurality of hydroxyl groups comprising the steps of: providing a solution comprised of a non-water-based hydrophilic organic solvent; a molecule which is drawn from the solution into the wood and produces an acid in the presence of water in the wood cellulose diffused as a chemical from the solution and bonding with wood in conjunction with water in the wood and generating in the bonding a catalyst; said solution further comprising a molecule drawn from the wood into the wood cellulose and not producing an acid in the presence of water in wood cellulose diffused as a chemical from the solution and bonding with wood cellulose in the presence of the catalyst generated by the molecule producing an acid in the presence of water in wood cellulose.

125. The process of claim 124 wherein the catalyst is an acid produced by the molecule which produces an acid in the presence of water in the wood cellulose is defined as a molecule producing an acid causing a spontaneous reaction of the molecule producing an acid in the presence of water in wood cellulose.

126. The process of claim 125 wherein the acid or a molecule which produces an acid in the presence of wood cellulose is in the range of 0.1-10% of the solution.

127. The process of claim 125 wherein the acid or a molecule which produces an acid in the presence of wood cellulose is in the range from 0.1-4.9% of the solution.

128. The process of claim 112 wherein the acid is selected from the group consisting of acids from

alkyl-silicon halides, acids from alkyl-hilade monomers with trivalent, tetravalent and pentavalent atoms, hydrochloric, meta-phosphoric acid, poly-phosphoric acid, and Phosphoric acid and combinations thereof, wherein the acid is in the range of 0.01-10% *in situ.*

129. The process of claim 128 wherein a molecule which produces an acid in the presence of water in wood cellulose is a molecule comprised of silicone and a halogen.

130. The process of claim 129 wherein a molecule which does not produce an acid in the presence of water in wood cellulose reacts exothermically and spontaneously with wood in the presence of a molecule which does produce an acid in the presence of water in the wood cellulose.

131. The process of claim 130 wherein the molecule which does not produce acid in the presence of water in the wood cellulose would include hydroxyl and alkoxyl bonded tetravalent atoms.